Deer Creek Erosion Control Project

FINAL REPORT

Prepared for the

United States Fish and Wildlife Service

and

The Deer Creek Watershed Conservancy

by

California State University, Chico Research Foundation

and

Meadowbrook Conservation Associates

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Thank you to all for your hard work and efforts,

Richard G. Holman
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PROJECT BACKGROUND

This Project is an attempt to identify the highest erosion sites in the Upper Meadows area of Deer Creek bounded by Childs Meadow to Slate Creek. The project is a follow up the Road Survey Project performed by Meadowbrook Conservation Associates in 1997.

It is well recognized that the soil conditions in the Upper Meadows area are non-cohesive highly erosive (Rhyolite). This soil is highly conducive to erosion thus increasing the turbidity in the stream. The Deer Creek Watershed Management Strategy describes the issue of sediment and bedload as follows:

> Fine Sediment Supply
> The road survey conducted in the upper watershed by Meadowbrook Associates in 1997 was a comprehensive, systemic inventory of sediment related to roads, which constitute the largest chronic sources. This study (based on field work conducted in 1996) found sediment yields were tied closely to geology, with the greatest yields from areas underlain by rhyolite and dacitic pyroclasic rocks. Moreover, the study concluded that most of the erosion was associated with a handful of preventative problems, such as plugged culverts, poorly designed low-water crossings, intercepted run-off from skid trails and landings and sloughing of fill-slope material. Total road-related erosion was estimated to be 15,450 yard of 18 yard/mi/year. Ironically, one landslide upstream of Deer Creek Meadows in 1997 probably mobilized more sediment than this estimated annual total, although most of the landslide debris did not reach the stream channel. The failed slope that generated the landslide is crossed by roads/skid trials, so the landslide itself may have triggered by road effects.
>
> The sediment that reaches the channel in the upper watershed has most likely contributed to channel instability in the Deer Creek Meadows Reach, potentially mobilizing more sediment from floodplain storage. However, once the sediment is transported downstream to the steeper, Canyon reaches, it appears to flush through.
>
> The soil series associated with the Rhyolite zone are most prone to fluvial erosion. These soils are very young and poorly developed and as a result are thin coarse textured and have very low cohesive strength. Texturally, these soils are classified as gravely/stony sandy loams. When distributed, these soils tend to produce copious amounts of overland run-off that is often channeled into roads and skid trails producing gully erosion. Rhyolitic soils are found on the upper 25 percent of the watershed.
>
> Poor logging practices are often associated with increased sedimentation. Private companies appear to harvest their trees using best management practices along stream corridors. Road construction can also increase sediment and organic debris accumulation, alter water quality and quantity, and increase human access to previously remote areas. Road construction activity is higher where timber is harvested. Roads, particularly in the Rhyolite area, can have large yields of fine sediment. Roads in the upper watershed suffered greatly during the January 1997 storm event. Fine sediment is stored in the Deer Creek Meadows area. However, it is apparently transported rapidly through the Highway 32, upper Canyon, and Lower Canyon Reaches because there are no bars evident.

This project will offer engineered solutions to specific sites identified in the Road Survey as well as other significant sources of erosion.

SUMMARY OF SITE REPORT INVESTIGATIONS

This report consists of twenty two sites as identified in the table of contents. It should be noted that although the table of contents indicates twenty two sites, there are actually 44 sites which have been addressed. For example, Site No. 4 actually comprises suggested engineering modifications for twenty three individual improvements (Sites 4-1 through 4-23). There are three sites identified that were initially included in the study which have been either repaired or were considered outside the scope of this project.

All sites include a general overview, any additional comments provided by the United States Forest Service, location, landowner and/or cost-share status, and a feasibility cost estimate. Photos for each site are included at the end of each site discussion and are clearly identified.

For each type of repair suggested, there are typical construction drawings provided in Appendix 1.

All of the sites included in this report are located in the Upper Meadows of Deer Creek in the area bounded by Childs Meadows, Deer Creek Upper Meadows, and Slate Creek. The individual sites have been classified as high, low, or medium priority. It should be noted that all of the sites in this report are significant sources of sediment due to erosion of the Rhyolite soil therefore a site which may be rated as a low priority is still significant however the goal of this report is to provide a prioritization tool for implementation.

The following three pages are a summary of information related to each site including Site Number, General Location, Recommended Repair, Landowner, Road Maintenance Responsibility, and Engineers Estimate.

The total feasibility construction cost estimate for the entire project is $3,139,403 including Direct Costs, Indirect Costs (5%), Overhead (3%), Profit (5%), and Contingency (15%). This estimate is for construction costs only and does not cover the cost of grant administration, permits, preparation of bid packages, construction management or additional engineering.

The total estimated construction cost for the “High Priority” sites is approximately $1,620,203.

Site No.	Location	Priority	Repair	Landowner	Maintenance	Estimate
1	Willis Road	Low	1. Rock Road 2. Add three cross drain culverts; two 24" and one 36" CMP 3. Install 250' of PMP to drain a wet spring area. 4. Establish definite 'out slope' to road surface and remove outside berms 5. Install rolling dips every 150 feet	USFS	USFS	$78,748
2	900 Spur @ Wilson Lake	Medium	Remove the existing segment of County Road #769 away from the drainage bottom	Collins Pine and County of Tehama	Collins Pine	$80,598
3	1550 spur near Childs Meadows	Low	Tank trap the lower end at the property line and treat the front end of the road, on Collins ownership, as a skid road with numerous standard water bars, eighty (80) feet apart. Install a standard tank trap at the junction of the main 1500 road to prevent passage by motor vehicles	Collins Pine	Collins Pine	$40,861
4-1	1500 Road from Hwy .36 @ Childs Meadows to Main Road I @ Hwy 32	High	Replace existing CMP with 18" x 36' CMP	Collins Pine	Collins Pine	$10,067
4-2	Same as 4-1, See GIS Map	High	1. Replace existing 18" CMP with 48" CMP 2. Energy Dissipater	Collins Pine	Collins Pine	$13,788
4-3	Same as 4-1, See GIS Map	High	1. Replace existing 12" CMP with 54" CMP or low water ford 2. Place Rip-Rap (on-site)	Collins Pine	Collins Pine	$16,490
4-4	Same as 4-1, See GIS Map	High	Rolling Dip and Energy Dissipater	Collins Pine	Collins Pine	$12,268
4-5	Same as 4-1, See GIS Map	High	Low Water Ford	Collins Pine	Collins Pine	$9,465
4-6	Same as 4-1, See GIS Map	High	Replace existing 18" CMP with 36"x40'	Collins Pine	Collins Pine	$13,332
4-7	Same as 4-1, See GIS Map	High	Energy Dissipater using native Rip-Rap	Collins Pine	Collins Pine	$1,974
4-8	Same as 4-1, See GIS Map	High	Replace existing 18" CMP with 48" x 40' with energy dissipater below.	Collins Pine	Collins Pine	$15,348
4-9	Same as 4-1, See GIS Map	High	Replace existing 18" CMP with two 36" x 32' with energy dissipater below	Collins Pine	Collins Pine	$18,854
4-10	Same as 4-1, See GIS Map	High	Replace existing 18" CMP with 48" x 36' Requires major energy dissipater below.	Collins Pine	Collins Pine	$24,878
4-11	Same as 4-1, See GIS Map	High	Replace existing 24" CMP with 36" x 40' CMP	Collins Pine	Cost-Share	$13,300

Site No.	Location	Priority	Repair	Landowner	Maintenance	Estimate
4-12	Same as 4-1, See GIS Map	High	Existing rolling dip adjacent to former landing. Riprap entire outlet	USFS	Cost-Share	$17,638
4-13	Same as 4-1, See GIS Map	High	Construct standard low water ford to replace existing 24"CMP. Dip road for channel crossing 120 feet to the north. Ample native riprap available on site.	USFS	Cost-Share	$21,875
4-14	Same as 4-1, See GIS Map	High	Replace existing culvert with 48" x 40' CMP or construct standard low-water ford. In either case, install standard Rip-Rap outlet	USFS	Cost-Share	$16,948
4-15	Same as 4-1, See GIS Map	High	Retain existing low water ford but riprap steep slope below	USFS	Cost-Share	$13,795
4-16	Same as 4-1, See GIS Map	High	Improve existing low water ford with application of 6" minus road surface rock 100 feet in both directions from drainage.	USFS	Cost-Share	$15,095
4-17	Same as 4-1, See GIS Map	High	Replace 18" CMP with standard rolling dip.	USFS	Cost-Share	$15,635
4-18	Same as 4-1, See GIS Map	High	Construct 3 low water fords in place of culverts over a 400' length of road	USFS	Cost-Share	$42,856
4-19	Same as 4-1, See GIS Map	High	Replace existing 18" CMP with 36" x 46' Provide energy dissipater below	Collins Pine	Cost-Share	$17,203
4-20	Same as 4-1, See GIS Map	High	Option A: Replace existing 18"CMP with standard low-water ford. Option B: Augment existing 18" CMP with a second 24" x 40'	Collins Pine	Cost-Share	$12,575
4-21	Same as 4-1, See GIS Map	High	Construct energy dissipater @ outlet of existing 18" CMP	Collins Pine	Cost-Share	$4,031
4-22	Same as 4-1, See GIS Map	High	Construct energy dissipater @ outlet of existing 18" CMP	USFS	Cost-Share	$4,031
4-23	Same as 4-1, See GIS Map	High	Riprap must be added to the entire lower road fill surface	Collins Pine	Cost-Share	$26,767
5	1545 spur @ Childs Meadows	Medium	Abandon existing road and encourage filling of head cut to natural conditions	Collins Pine	Collins Pine	$90,787
6	1500 Road Crossing	High	Construct a pre-stressed concrete slab bridge, 30-foot span by 12 or 16-foot width	Collins Pine	Cost-Share	$134,084
7	1510/1511 switchback	High	Construct a low-water ford Option A: Rock road surface, where it exceeds 3% grade, to eliminate sheet erosion. Option B: After short haul period of upcoming harvest operations (2001?), close road with tank trap and install water bars every 50 feet for its entire length.	Collins Pine	Collins Pine	$51,415

Site No.	Location	Priority	Repair	Landowner	Maintenance	Estimate
8	1400 Road	Low	Replace the culvert with a standard low-water ford, obliterate the road ditch, and out slope the entire road segment. Block off-road traffic to the banks of Gurnsey Creek with large cull logs or large native rocks.	Collins Pine	Collins Pine	$63,788
9	Former Highway 36 Wood Structure Bridge	High	Remove the bridge	Collins Pine	Collins Pine	$299,558
10	1422 spur	High	Install periodic debris dams	Collins Pine	Collins Pine	$65,546
11	1420 Road	High	**Option A:** 1. Obliterate 1420 road from north boundary of the SE¼SE¼, Section 8, T28N, R5E to the end of the spur. 2. USFS provides access to Collins for a future road originating from the 1500 road near the west boundary of Section 8 and running southeasterly down the ridge top in Section 8. **Option B:** Retain the current 1420 road but treat it as a closed road in between harvest cycles. Tank trap the road below its steep ascent and treat the remaining road, north of the tank trap, as a skid trail with numerous water bars spaced at 50 foot intervals. **Option C:** Trade Collins land in Section 8, T28N, R5E to USFS; obliterate the 1420 spur north of the SE¼SE¼ of Section 8.			$90,460
12	Main Road I	High	Using standard USFS rock specifications for forest roads, apply a crushed rock surface to Main Road I to reduce sedimentation of adjacent streams from road surface erosion.	USFS and Collins Pine	Cost-Share	$447,789
13	1800A/1700 Road junction	High	Replace the decayed bridge with a more permanent structure	Collins Pine	Cost-Share	$97,718

Site No.	Location	Priority	Repair	Landowner	Maintenance	Estimate
14	Collins 1700 Spur	High	1. Narrow the road width to 18 feet 2. Provide additional rolling dips 3. Establish an out slope road surface; 4. Eliminate the inside ditch where beneficial 5. Abandon that portion of the 1700 through USFS ownership north of the east / west centerline of Section 13, T.28N., R.4E 6. Apply a 4-inch crushed rock surface to the final road.	Collins Pine	Cost-Share	$200,227
15	Collins 1820 Spur	Low	Rock the road surface, from the junction of the 1820 to the junction of the 1821	Collins Pine	Cost-Share	$93,335
16	1821 Road system	Low	Out sloped and crushed rocked road surfaces	Collins Pine	Cost-Share	$495,044
17	Lower Swamp Creek Bridge on Main Road I	Medium	Replace the decayed log stringer bridge with a more permanent structure	Collins Pine	Cost-Share	$122,382
18	1920 Road	N/A	No Work Required	Collins Pine	Collins Pine	$0
19	Main Road I Rocking; Round Valley to Onion Summit	High	Using standard USFS rock specifications for forest roads, apply a crushed rock surface to Main Road I to reduce sedimentation of adjacent streams from road surface erosion.	USFS and Collins Pine	Cost-Share	$272,791
20	2200 Road	High	1. Recommend abandonment of the most troublesome segment of the eastern loop of the 2200 spur (1,600 feet) 2. Install tank traps at both ends to prevent traffic access. 3. Rip the entire surface of abandoned road, slope profile to original contour, and remove berms.	Collins Pine	Collins Pine	$56,058
21	Main Road l @ Forked Creek	N/A	No Work Required	USFS	USFS	$0
22	1112-1 spur	N/A	No specific site solutions were determined to be applicable to this project.	Collins Pine	Collins Pine	$0

GPS LONGITUDE/LATITUDE

Site #	Road Location	N	W
1	Willis Rd. 1435	40*18.165'	121*25.035'
2	900	40*20.379'	121*27.639'
3	1550	40*19.890'	121*29.278'
4.1	1500	40*21.214'	121*29.854'
4.2	1500	40*20.585'	121*29.737'
4.3	1500	40*20.170'	121*29.436'
4.4	1500	40*20.129'	121*29.428'
4.5	1500	40*20.030'	121*29.410'
4.6	1500	40*20.012'	121*29.397'
4.7	1500	40*19.666'	121*29.221'
4.8	1500	40*19.610'	121*29.196'
4.9	1500	40*19.559'	121*29.171'
4.10	1500	40*19.436'	121*29.106'
4.11	1500	40*19.280'	121*28.999'
4.12	1500	40*19.263'	121*28.969'
4.13	1500	40*19.177'	121*28.809'
4.14	1500	40*19.028'	121*28.592'
4.15	1500	40*18.968'	121*28.364'
4.16	1500	40*18.954'	121*28.186'
4.17	1500	40*18.619'	121*27.740'
4.18	1500	40*18.532'	121*27.725'
4.19	1500	40*18.355'	121*27.610'
4.20	1500	40*18.287'	121*27.497'
4.21	1500	40*17.974'	121*26.160'
4.22	1500	40*17.816'	121*26.019'
4.23	1500	40*17.460'	121*26.761'
5	1545	40*19.452'	121*29.097'
6	1500	40*16.532'	121*26.384'
7	1510/1511	40*16.610'	121*26.647'
8	1400	40*17.076'	121*25.520'
9	1400	40*17.391'	121*25.405'
10	1422	40*17.493'	121*26.076'
11	1420	40*17.714'	121*26.426'
12	MR I	40*16.235'	121*26.048'
13	1800A/1700	40*16.149'	121*28.673'
14	1700	40*17.284'	121*29.128'
15	1820	40*16.744'	121*29.901'
16	1821	40*16.659'	121*30.227'
17	MR I	40*15.588'	121*28.498'
18	1920	40*14.907'	121*29.837'
19	MR I	40*14.362'	121*30.428'
20	2200	40*14.637'	121*31.170'
21	MR I	40*13.548'	121*31.951'
22	1112-2	40*15.088'	121*22.041'

Site 1

AFRP Grant Site List: Willis Road Rocking (one of the four original sites) – Road rocking only, USFS will prepare road for rocking with their funds.

AFRP Grant Site List – Forest Service Notes: Site 1. Willis Road Rocking. Include in design package the cost to improve drainage plus rocking. Relocation opportunities have already been explored, and cooperators have agreed that the current location is acceptable.

Site Name: Willis access road to hydroelectric reservoir.

Longitude, Latitude: N40º19.610' W121°29.196'

General Description: Access road to the Willis hydroelectric reservoir shows erosion due to poor drainage and steep grade near dam.

Goals: Reduce sediment from subject road likely to be tributary to Gurnsey Creek.

Priority (assessed in July 2001): Low (compared with a breach of the reservoir dam during high flow events).

Specifics: the following will provide improved drainage:

1. Add three cross drain culverts; two 24" and one 36" CMP to improve passage of water across the road profile.
2. Install 250' of PMP to drain a wet spring area.
3. Establish definite 'out slope' to road surface and remove outside berms.
4. Install rolling dips every 150 feet.

Ken Willis has not been cooperative in the past on environmental improvement projects. Due to his intolerance, no field markers were placed along this road for fear of inciting an adverse reaction. Should this site be selected for the final implementation grant, location of the above drainage structures will be obvious by actual drainage crossing the road profile. Grass growth and visible weeping mirror the spring's location requiring installation of PMP along the road. The out slope prescription is applicable for the entire road, except exiting the dam's face and from the hydroelectric powerhouse to the ford crossing of Gurnsey Creek. Rolling dips are applicable for all grades over 3%.

Photo 1.a—Gurnsey Creek Ford—Willis Road
Photo 1.b—Willis Road along weeping spring

Photo 1.a

Gurnsey Creek Ford—Willis Road

Photo 1.b

Spring seep along the Willis Road

Site 2

AFRP Grant Site List: 900 Spur @ Wilson Lake – Look at upgrading to possibly replace County Road that runs up drainage. Contact Tehama County Roads Department regarding putting a section of their road (County Road 769 – Wilson Lake Road) to bed.

AFRP Grant Site List – Forest Service Notes: Collins 900 spur. (45uc) Assess the possibility of replacing a section of the county road (portion running in the drainage) with a portion of the 900 spur, which currently parallels the county road. The 900 spur is just north of the county road and stays out of the drainage. The 900 spur was repaired in 2000 but additional improvements may be necessary if this road were to replace the county road. A nick point may have been created at one repaired crossings and diversion potential may not have been eliminated. Design should include the cost of any upgrades, the cost of decommissioning the portion of county road, and the County's willingness to buy into the proposal. (FS site # S&E D29-003 on spreadsheet).

Site Name: Wilson Lake County Road #769

General Description: A section of the Tehama County Road west of Wilson Lake runs through USFS ownership and immediately adjacent to the bottom of an unnamed drainage. This section of county road is described as: beginning at the SE1/16th. Corner of Section 30, T.29N., R.5E., and running eastward on the Wilson lake County Road to its crossing of the Collins 900 Road near the south boundary of the NESW of Section 29, T.29N., R.5E., approximately 3,800 lineal feet. During high runoff conditions, this road segment becomes the active stream channel. The USFS would like to relocate the county road away from this drainage on their ownership. Coincidentally an existing parallel road exists (Collins 900 Spur) that would provide better separation from this drainage and allow the troublesome segment of county road to be abandoned.

Goals: Remove the existing segment of County Road #769 away from the drainage bottom.

Priority (assessed in July 2001): Medium

Specifics: The Collins road is clearly a better route for the county road. Most new county easements, however, require a minimum 60-foot right-of-way, wider than the actual existing road surface of the Collins 900 spur. If Collins agreed to deed their road to the county, they probably will not want to lose any timberland in the process. Discussions between Collins Almanor Forest Agents and Tehama County's Road Department need to be completed, before further work on this site is attempted.

Photo 2.a Segment of the Wilson Lake County Road to be abandoned.
Photo 2.b Segment of the Wilson Lake County Road to be abandoned.

Photo 2.a

Site 2: Wilson Lake County Road

Photo 2.b

Site 2: Wilson Lake County Road

Site 3

AFRP Grant Site List: 1550 spur near Childs Meadows - Evaluate road conditions and determine what needs to be done.

AFRP Grant Site List – Forest Service Notes: 1550 spur that extends onto FS parcel. (13uc) Evaluate road condition and determine what should be done. Option to obliterate section of road on FS should be evaluated.

Site Name: Collins 1550 Spur

General Description: USFS has suggested that this road be abandoned.

Goals: Reduce sediment transport from road profile.

Priority (assessed in July 2001): Low; little active erosion and low likelihood for direct transport into Gurnsey Creek.

Specifics: Field inspection indicates very little active erosion at the end of this road on USFS property. Much of the end of this road is now converting to white thorn brush cover and has a high woody material cover. Recommend not disturbing this healing process on USFS ownership by exposing more bare soil through equipment activity. Tank trap the lower end at the property line and treat the front end of the road, on Collins ownership, as a skid road with numerous standard water bars, eighty (80) feet apart. Install a standard tank trap at the junction of the main 1500 road to prevent passage by motor vehicles, until the next Collins harvest cycle.

Photo 3.a—1550 Road
Photo 3.b—1550 Road

Photo 3.a

1550 Road entering USFS ownership.

Photo 3.b

1550 Road with natural vegetation.

Site 4

AFRP Grant Site List: 1500 Road -Do complete assessment from the Hwy .36 @ Childs Meadows to Main Road I @ Hwy 32.

AFRP Grant Site List – Forest Service Notes: 1500 road (28N88) Do a complete assessment from Hwy. 36 at Childs Meadows to Main Road I at Highway 32. FS has some information on two sites (D28-016 and 23). See attached spreadsheet.

Site Name: Collins 1500 Road - USFS/Collins cost share road.

General Description: The 1500 Road is a cost share road between the USFS and Collins Pine Company. It parallels the west side of the Gurnsey Creek meadow complex from Highway 36 at Childs Meadows to Highway 32 at Deer Creek Meadows. The entire route runs through rhyolite soils and the adjacent terrain tips steeply to the west. Tributaries draining these steep rhyolite sub basins flow across the road profile on their course toward the main Gurnsey channel. Erosion from roads of this geomorphology is generally high and the 1500 Road is no exception. Following portions of existing wagon roads, this road system was constructed in the 1940's to mid-1950's. As culvert and drainage standards improved over the decades, these reflected in the kinds of repair applied at the time. Drainage has vastly improved, especially after the mid-1970's, with more frequent and larger diameter structures. In spite of that, this road still has the potential to produces a significant quantity of sediment into the Gurnsey Creek.

Goals: Reduce sediment transport into the Gurnsey system by: (1) reducing runoff from the road surface and its parallel ditch and (2) reducing the probability of road washouts from runoff exceeding the capacity of its associated cross drainage structure. Substitution of low-water ford structures instead of traditional culverts, where appropriate, was considered.

Priority (assessed in July 2001): High

Specifics:

Starting from Hwy 36 at Childs Meadows, the following drainage sites were identified. Each site was field marked with its unique number and later the GPS position was determined by Collins Pine forestry staff. Items indicated by asterisk (*) are landmarks for field reference.

Site 4-1: Replace existing CMP with 18" x 36' CMP

Photo 4.a—1500 Road Site 4.1—Culvert– upstream view
Photo 4.b—1500 Road Site 4.1—Culvert– downstream view

* Junction 1572
* Cross East/West Centerline Section 25

Site 4-2: Replace existing 18" CMP with 48" CMP or low water ford. Low water ford must be heavily rip rapped or of impervious material, i.e. concrete. Road forms 4.5 foot drop below drainage crossing which requires major energy dissipater in light of potential discharge or extended dip to road grade. Culvert is recommended.

Photo 4.c—1500 Road Site 4.2—Culvert–upstream view
Photo 4.d—1500 Road Site 4.2—Culvert– downstream view
* Junction 1570/1566 @ SW 1/16 corner of Section 25
Behind this point a ditch is generally present, wide road surface, but little erosion visible.
Ahead are steep terrain, heavy rhyolite, occasional ditch, and frequent surface erosion.

Site: 4-3 Replace existing 12" CMP with 54" CMP or low water ford.
Creek has ample rock base, some elevation drop below road, and large rock in area for riprap.

Photo 4.e—1500 Road Site 4.3—Culvert– upstream view
Photo 4.f—1500 Road Site 4.3—Culvert– downstream view

Site: 4-4 Active rill erosion on road surface. Needs rolling dip but requires energy dissipater below. Photo 4.g—1500 Road Site 4.4—Water damage from skid trail above 1500 road

* Junction of 1560. Although not on project list, this spur needs attention or abandoned.

Site: 4-5 In the middle of former landing, immediately south of junction with 1560 spur.
Install either 18"CMP or low water ford. Culvert is not compatible with future use of existing landing.

Photo 4.h—1500 Road Site 4.5—Erosion at junction of 1560 spur road
Photo 4.i—1500 Road Site 4.5—Above
Photo 4.j—1500 Road Site 4.5—Below

Site: 4-6 200 feet south of Site 4-5 is draw that drops steeply to road. Replace existing 18" CMP with 36"x40'

Photo 4.k—1500 Road Site 4.6—Above
Photo 4. l—1500 Road Site 4.6—Below

* Junction of 1550 spur.

* C 1/4 section corner of section 36

Site: 4-7 Retain current low water crossing but install energy dissipater (native rip rap) below.

Photo 4.m—1500 Road Site 4.7—Above
Photo 4.n—1500 Road Site 4.7—Below

Site: 4-8 Replace existing 18" CMP with 48" x 40' with energy dissipater below.
Photo 4.o—1500 Road Site 4.8—Above
Photo 4.p—1500 Road Site 4.8—Below

Site: 4-9 Replace existing 18" CMP with two 36" x 32' with energy dissipater below.

Photo 4.q—1500 Road Site 4.9—Above
Photo 4.r—1500 Road Site 4.9—Below

* Junction of 1545 spur.

Site: 4-10 Replace existing 18" CMP with 48" x 36' Requires major energy dissipater below.
Photo 4.s—1500 Road Site 4.10—Above
Photo 4.t—1500 Road Site 4.10—Below

* South Boundary of Section 36

Site: 4-11 Replace existing 24" CMP with 36" x 40' CMP This creek is flowing on 6/17/01.
Photo 4.u—1500 Road Site 4.11—Above
Photo 4.v—1500 Road Site 4.11—Below

Site: 4-12 Existing rolling dip adjacent to former landing. Riprap entire outlet.
Photo 4.w—1500 Road Site 4.12—Above
Photo 4.x—1500 Road Site 4.12—Below

Site: 4-13 Huge mudslide from wet winter 1997, construct standard low water ford to replace existing 24"CMP. Dip road for channel crossing 120 feet to the north. Ample native riprap available on site.
Photo 4.y—1500 Road Site 4.13—Above
Photo 4.z—1500 Road Site 4.13—Below

* West boundary of section 6 28/5

Site: 4-14 Option: Replace existing culvert with 48" x 40' CMP or construct standard low-water ford; in either case, install standard riprap outlet.
Photo 4.aa—1500 Road Site 4.14—Above
Photo 4.bb—1500 Road Site 4.14—Below

Site: 4-15 Retain existing low water ford but riprap steep below
Photo 4.cc—1500 Road Site 4.15—General View

Site: 4-16 Improve existing low water ford with application of 6" minus road surface rock 100 feet in both directions from drainage. Lower edge of road is steep vertical rock bank that requires no further erosion protection.
Photo 4.dd—1500 Road Site 4.16—General View

* 1500 Summit—Historic note on road from this summit north to Highway 32: Few culvert or low-water cross drains existed, until the late 1970' s early 1980's. Most of this road has a wide and deep eroded ditch from various flood events. Typical soils are rhyolitic with high gravel-size component, especially adjacent to natural watercourses. Over time, increased installations of cross drains have reduced erosion. However, former eroded ditches and areas near cross drains have been slow to revegetate, especially in gravels where fines have been washed away. Much past damage appears to be fresh. The following recommendations attempt to prevent surface flow over these bare areas. Some ditch lines are healing with natural trees and brush. Where this has occurred, allow trees and brush to grow (preferred) rather than further disturbing the area by removing ditch completely. South of the 1500 summit, provide the following: (1.) Standard rolling dips every 400 feet of continuous road grade to drain bank water. (2.) Abandon road ditch (except as noted above) and provide out sloped road surface. (3.) Narrow existing road to 16' wide plus sufficient additional width for intervisible turnouts.

Site: 4-17 Replace 18" CMP with standard rolling dip.

Site: 4-18 Over next 400', construct three low-water fords in place of culverts. Humps between low water fords such that water must cross road instead of flowing parallel to road.
Photo 4.ee—1500 Road Site 4.18—Above
Photo 4.ff—1500 Road Site 4.18—Below

Site: 4-19 Replace existing 18" CMP with 36" x 46' Provide energy dissipater below
Photo 4.gg—1500 Road Site 4.19—Above
Photo 4.hh—1500 Road Site 4.19—Below

Site: 4-20 Option A: Replace existing 18"CMP with standard low-water ford.
Option B: Augment existing 18" CMP with a second 24" x 40'
Photo 4.ii—1500 Road Site 4.20—Above
Photo 4.jj—1500 Road Site 4.20—Below

Site: 4-21 Construct energy dissipater @ outlet of existing 18" CMP

Photo 4.1a

Site 4.1—Culvert–upstream view

Photo 4.1b

Site 4.1—Culvert–downstream

Photo 4.2a

Site 4.2—Culvert—Upstream

Photo 4.2b

Site 4.2—downstream view

Photo 4.3a

Site 4.3—Culvert—upstream view

Photo 4.3b

Site 4.3—Culvert—downstream view

Photo 4.4a

Site 4.4—Water damage from skid trail above 1500 road

Photo 4.5a

Site 4.5—Erosion at junction of 1560 spur road

Photo 4.5b

Site 4.5—Above

Photo 4.5c

Site 4.5—Below

Photo 4.6a

Site 4.6—Above

Photo 4.6b

Site 4.6—Below

Photo 4.7a

Site 4.7—Above

Photo 4.7b

Site 4.7—Below

Photo 4.8a

Site 4.8—Above

Photo 4.8b

Site 4.8—Below

Photo 4.9a

Site 4.9—Above

Photo 4.9b

Site 4.9—Below

Photo 4.10a

Site 4.10—Above

Photo 4.10b

Site 4.6—Below

Photo 4.11a

Site 4.11—Above

Photo 4.11b

Site 4.11—Below

Photo 4.12a

Site 4.12—Above

Photo 4.12b

Site 4.12—Below

Photo 4.13a

Site 4.13—Above

Photo 4.13b

Site 4.13—Below

Photo 4.14a

Site 4.14—Above

Photo 4.14b

Site 4.14—Below

Photo 4.15a

Site 4.15—General View

Photo 4.15b

Site 4.16—General view

Photo 4.18a

Site 4.18—Above

Photo 4.18b

Site 4.18—Below

Photo 4.19a

Site 4.19—Above

Photo 4.19b

Site 4.19—Below

Photo 4.20a

Site 4.20—

Photo 4.20.b

Site 4.20—Below

Photo 4.23a

Site 4.23—Above

Site 5

AFRP Grant Site List: 1545 spur @ Childs Meadows (one of the four original sites) -evaluate road conditions and determine what needs to be done. Design and cost.

AFRP Grant Site List – Forest Service Notes: 1545 spur at Childs Meadow. Evaluate road conditions and determine what needs to be done. A11 private.

Site Name: Collins 1545-1 Spur road

General Description: The 1545-1 spur is located on relatively flat terrain. In spite of the gentle grade, a head cut has developed on the road surface from natural drainage water collecting on the road. This likely initiated during a single high flow event and has gradually increased in size with reoccurring high runoff.

Goals: Abandon existing road and encourage filling of head cut to natural conditions

Priority (assessed in July 2001): Medium

Specifics: Divert the runoff from Site 4-9 back onto natural terrain immediately downstream from this location. During the upcoming scheduled harvest operation (2001 or 2002), place small tops (4 to 5 inch diameter on the large cut end) from adjacent harvest trees into the head cut ravine on the 1545-1 road. Machine compress these tops such that their fine branches form a natural screen to entrap future sediments. The entangled tops provide a stable structure to hold these sediments, until natural vegetation is reestablished. Abandon the 1545-1 with a standard tank trap at its junction with the 1545 road. The current CDF approved Timber Harvest Plan calls for construction of a parallel replacement road 100 to 200 feet north of the head cut. This new road must be thoroughly put to bed, after harvest activities, to prevent a similar head cut from forming there.
Photo 5.a—Start of 1545-1. Natural stream (from Site 4-9) flows parallel with 1545 and onto the 1545-1 Road.
Photo 5.b—Prior to start of head cut.
Photo 5.c—Beginning of head cut.
Photo 5.d—Mid way along head cut.
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Photo 5.a

Site 5: Road 1545-1—Water source that initiated head cut..

Photo 5.b

Site 5: Road 1545-1—Prior to start of head cut.

Photo 5.c

Site 5: Road 1545-1—Beginning of head-cut.

Photo 5.d

Site 5: Road 1545-1—Midway along head-cut.

Site 6

AFRP Grant Site List: 1500 Road bridge or low water crossing (one of the four original sites) - Design low water crossing.

AFRP Grant Site List – Forest Service Notes: 1500 Road Crossing. Put together a design for a low-water crossing or bridge.

Site Name: Unnamed tributary on the Collins 1500 road

General Description: This unnamed tributary of Gurnsey Creek has repeatedly plugged or exceeded the capacity of various sized culverts three times in the last 25 years. High flows in this creek produce high bed load movement placing culverts vulnerable to plugging. This stream flows all year and supports spawning and rearing of juvenile native salmonids. Most of the original road fill has already washed downstream. Left alone, little additional sedimentation is likely to occur. However, the north end of the 1500 road is blocked to heavy truck traffic and repair is desired.
During field inspection, consideration for construction of either a bridge or low water ford was considered. Both alternatives have advantages but construction costs and unlimited passage of fish favor placement of a bridge. Some effort has already been invested at the site to provide stable footings for a bridge.

Goals: Construct a pre-stressed concrete slab bridge, 30-foot span by 12 or 16-foot width. The road alignment and sight distance would allow safe traffic movement over a 12-foot wide bridge.

Priority (assessed July 2001): High, if 1500 road must soon support heavy traffic; otherwise low.

Specifics:

Photo 6.a—1500 Road—Washed out stream crossing
Photo 6.b—1500 Road—Washed out stream crossing looking downstream

Photo 6.a

Site 6: 1500 Road—Failed stream crossing.

Photo 6.b

Site 6: 1500 Road—Failed stream crossing; looking downstream

Site 7

AFRP Grant Site List: 1510/1511 switchback -Look at stabilizing the road surface with proper drainage, rocking, etc. What do we do with the 1511 at the drainage? Design and cost.

AFRP Grant Site List – Forest Service Notes: 1510/1511 Switchback. Look at stabilizing the road with proper drainage, rocking etc. What do we do with the 1511 at the drainage? Come up with a design and cost package. All private.

Site Name: Collins 1510/1511 Spurs

General Description: These spurs show severe road surface erosion and one washed out stream crossing.

Goals: Reduce road surface erosion and provide a temporary stream crossing instead of installing a permanent culvert.

Priority (assessed in July 2001): High

Specifics: (1.) At the stream washout on the 1511 spur, construct a low-water ford late in the summer of the next scheduled timber harvest. No crossing until stream flow ceased for the summer and remove ford immediately after use. (2.) The main 1510 spur is steep through its 'switch back' at the junction of the 1511 spur. Sheet erosion off this steep grade is difficult to prevent as long as this road remains open to traffic. Recommended corrective options are:

Option A: Rock road surface, where it exceeds 3% grade, to eliminate sheet erosion.

Option B: After short haul period of upcoming harvest operations (2001?), close road with tank trap and install water bars every 50 feet for its entire length.

With either option, do not remove existing vegetation now established in ditch line or along road shoulders. Photo #7.a shows ideal natural vegetation that should not be removed just for the sake of 'grading the road'.

Photo 7.a—Site 7—1510/1511 Road—Well established ditch vegetation
Photo 7.b—Site 7—1510 Road—Sheet erosion off road surface.

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Photo 7.a

Site 7: 1510 Road—Well established ditch vegetation.

Photo 7.b

Site 7: 1510 Road—Sheet erosion off road surface

Site 8

AFRP Grant Site List: 1400 Road- stabilize road where it dips down to creek (at culvert), close off access to Creek?

AFRP Grant Site List – Forest Service Notes: 1400 Road. Stabilize the road where it dips down to the Creek (at culvert). Explore opportunity to eliminate vehicle access to the Creek. All private.

Site Name: 1400 Road

General Description: Road surface erosion at a minor tributary crossing was inspected. The primary cause of this erosion is excessive water flow down the road surface from poor drainage structures. A plugged culvert diverted water onto the road surface, until it finally exited via an out slopped section

Goals: Replace the culvert with a standard low-water ford, obliterate the road ditch, and out slope the entire road segment. Block off-road traffic to the banks of Gurnsey Creek with large cull logs or large native rocks.

Priority (assessed in July 2001): Low

Specifics: The offending culvert drains a small area that easily could be handled by construction of a standard low-water ford. Elimination of the road ditch and establishing an out-slopped road surface are logical associated tasks at this time.
Access to the banks of Gurnsey Creek by campers and hunters is possible with somewhat more effort. Camping occurs on the flood plane of Gurnsey Creek by various recreational vehicles from large motor homes to pick-up campers. The gentle open terrain offers multiple exit points from the 1400 road. Closure could be obtained by placing large cull logs or rocks parallel to the lower road edge.

Photo 8.a—1400 Road—Site of proposed low-water ford.
Photo 8.b—1400 Road—Erosion after culvert failure.

Photo 8.a

Photo 8.a—1400 Road—Site of proposed low-water ford.

Photo 8.b

Photo 8.b—1400 Road—Erosion after culvert failure.

Site 9

AFRP Grant Site List: Demo abandoned bridge off 1400 Road (one of the four original sites) at Gurnsey Creek. Get estimate on cost**.**

AFRP Grant Site List – Forest Service Notes: Bridge Removal: Remove old highway 36 bridge on 1400 road at Gurnsey Creek. Design and cost package should include list of required permits, any required demolition techniques, disposal requirements, and a couple cost estimates from legitimate demolition companies.

Site Name: Former Highway 36 Wood Structure Bridge

General Description: A portion of Highway 36 was quitclaimed back to the Collins Almanor Forest owners, after the Christmas 1964 flood. A wood structure bridge, across the North Fork of Deer Creek, is part of this quitclaimed segment. The supports for this bridge have been damaged in repeated high flows. A future high flow will likely cause the bridge to collapse sideways into the stream channel. The resulting blockage would cause the stream to back up, until it flowed around the 'dam'. Channel and bank erosion from this might be significant.

Goals: Remove this bridge before the next high water does it instead.

Priority (assessed in July 2001): High, assuming the next flood event will bring the bridge down.

Specifics: Type contract specifications and send interested contractors an invitation to bid the removal of this bridge. This project can be completed without entry into the active channel by contractor's equipment and should be required in the invitation to bid and the resultant contract. Asphalt removed from the bridge deck could be recycled in a nearby road fill.. Bridge timbers might be stacked in adjacent turnouts for easy removal by Collins for use in other projects. The one continuous concrete footing should be left in the channel. Other individual concrete pillars might be used as rip rap or traffic barricades at Site 8. Unusable treated timbers could be placed in other safe locations as burning would be unlawful.

9.a

Site 9: Log Jam Above Old Hwy 36 Bridge

9.b

Site 9: Log Jam Above Old Hwy 36 Bridge

Site 10

AFRP Grant Site List: 1422 spur -look at stabilizing channel erosion near old rock pit. Design and cost.

AFRP Grant Site List – Forest Service Notes: 1422 Spur. Look at opportunities to stabilize channel erosion near the old rock pit. Design and cost. All private

Site Name: Channel erosion near old borrow pit on Collins 1422 spur.

General Description: 1,400 feet of severe channel erosion along unnamed tributary to N. Fork Deer Creek. Initial cause of head cut is unknown. An old borrow pit exists in the upper reach of this eroded channel. Collins had little success placing a log sediment dam in this reach in 1997.

Goals: Reduce channel erosion and eventually stabilize stream banks.

Priority (assessed in July 2001): high

Specifics:

Photo #10a: Far upper reach – above proposed treatment area. Example of woody material in draw, although ineffective due to poor placement and too infrequent to be a substantial benefit. Rhyolite soils, little rock in parent material, gentle creek grade but high bank erosion.

Photo #10b & 10c: Upper boundary of proposed treatment area. These photos (upstream / downstream) show presence of natural woody material. Head cut has moved upstream to this point and temporarily halted by this debris dam. Objective: prevent head cut from moving above this point and install periodic debris dams from this point to lower end of treatment area.

Photo #10d: 14 chains down stream immediately below old borrow pit. Bank erosion severe with numerous undercut and toppled trees along channel banks. As in Photo 10-1, this woody material has ineffective position in channel for reducing channel erosion; too high and off the channel bottom.

Photo #10e: 4 chains further downstream. Woody material here is across the channel and more effective.

Photo #10f: 3 chains further downstream. The remains of an artificial debris (log) dam installed by Collins in 1997-98; these small white fir logs were placed by an excavator across the channel bottom and keyed into the banks. Original dam height was less than 14 inches and had log apron below to restrict undercutting. Although the stream moved these logs diagonally across the channel making it less effective as a sediment trap, increased presence of grass and herbs in channel have positive result.

Photo #10g: Second natural debris dam shows importance of woody material directly on channel bottom.

Photo #10h: Spring activity in stream bank immediately below previous photo has resulted in accelerated bank erosion. This highlights the effect of soil moisture (at field capacity) in accelerating mass movement in rhyolite soils.

Photo #10i: Three chains further at the lower end of the proposed treatment area, the channel merges with

another wet tributary. Below this junction, ample channel bank vegetation exists to stabilize the channel banks. Did the head cut start here or migrate both up and down stream from a point within the proposed treatment reach?

Photo 10.a	1422 Spur road—Woody Material above treatment area

Photo 10.b

1422 Spur road—Looking downstream, upper end

Photo 10.c

1422 Spur road—Looking upstream, upper end

Photo 10.d

1422 Spur road—Ineffective natural woody material

Photo 10.e

1422 Spur road—effective natural woody material

Photo 10.f

1422 Spur road—Collins log-debris dam

Photo 10.g

1422 Spur road—Natural log-debris dam

Photo 10.h

1422 Spur road—Spring caused vertical bank

Photo 10.i

1422 Spur road—Stable lower end of treatment

Site 11

AFRP Grant Site List: 1420 Road -look at trying to stabilize.

AFRP Grant Site List – Forest Service Notes: Look at opportunities to stabilize. (S&E D28-041). FS definitely interested in obliterating this section of road if Collins agrees. If obliteration not an option stabilizing and closing this piece to traffic should be strongly considered.

Site Name: USFS / Collins cost share road; 1420 spur.

General Description: The back end of the 1420 spur runs alternating through USFS and Collins ownership. The road grade varies between 6 and 10 percent. This road shows significant surface erosion due to steep grade and poor drainage in rhyolite soils.

With their current management direction, the USFS has little use for the 1420 spur. Timber harvesting within the scattered USFS ownership in Section 8, T28N, R5E is not likely in the foreseeable future. Collins might have little use for the back end of the 1420 spur should future harvests in the NE¼NW¼ and SW¼NE¼ of Section 8 be limited to cable systems. A new road tributary to the 1500 road, built on the ridge top in Section 8, would permit abandoning the 1420 spur north of the SE¼SE¼ of Section 8.

Goals: Reduce erosion from existing road surface.

Priority (assessed in July 2001): High

Specifics:

Option A: 1. Obliterate 1420 road from north boundary of the SE¼SE¼, Section 8, T28N, R5E to the end of the spur. 2. USFS provides access to Collins for a future road originating from the 1500 road near the west boundary of Section 8 and running southeasterly down the ridge top in Section 8.

Option B: Retain the current 1420 road but treat it as a closed road in between harvest cycles. Tank trap the road below its steep ascent and treat the remaining road, north of the tank trap, as a skid trail with numerous water bars spaced at 50 foot intervals.

Option C: Trade Collins land in Section 8, T28N, R5E to USFS; obliterate the 1420 spur north of the SE¼SE¼ of Section 8.

Photo 11.a

Site 11: 1420 Road looking down the road

Photo 11.b

Site 11: 1420 Road looking down the road

Site 12

AFRP Grant Site List: Rock Main Road I from Hwy 32 to Slate Creek.

AFRP Grant Site List – Forest Service Notes: Main Road I from Highway 32 to Slate Creek. Look at opportunities to rock this section of road.

Site Name: Main Road I Rocking; Highway 32 to Slate Creek.

General Description: Collins Pine asked to extend the western boundary of Site 12 from Alder Creek to Slate Creek. Rhyolite parent material of road base would benefit from application of 4 inches of crushed rock. Source of this rock is an existing pit near Onion Summit or from a proposed new pit (currently undeveloped) on the 2000 spur. Collins needs to decide which location is desirable.

Goals: Using standard USFS rock specifications for forest roads, apply a crushed rock surface to Main Road I to reduce sedimentation of adjacent streams from road surface erosion.

Priority (assessed July 2001): High

Specifics: Rocking Main Road I would greatly decrease the quantity of sediments annually washed off this well traveled road.

Photo 12.a

Main Road I east of Alder Creek.

Photo 12.b

Main Road near its junction with Highway 32.

Site 13

AFRP Grant Site List: 1800A / 1700 Road junction (28N89) -Look at replacing log stringer bridge.

AFRP Grant Site List – Forest Service Notes: 1800A / 1700 Road Junction (28N89). Replace log-stringer bridge. Design must meet FS specifications on this cost share road. Another log stringer bridge does not meet today's specifications.

Site Name: Upper Swamp Creek Bridge on Collins 1800 Spur

General Description: The current log bridge across Swamp Creek is twenty-plus years old and its log stringers are rotten. The fill across this bridge is sagging, indicating the bridge is beginning to collapse.

Goals: Replace the decayed bridge with a more permanent structure that prevents bank erosion after collapse during high flow conditions. This work requires no equipment within the stream channel, beyond an excavator's bucket.

Priority (assessed in July 2001): High

Specifics: Similar to the lower Swamp Creek bridge, remove existing bridge after the new bridge is in place. Location of new bridge is 30 feet upstream, where excellent rock banks will protect footings from future channel erosion. Pre-poured footings and pre-stressed concrete slabs comprise the new structure.

Constructing road approaches to new bridge are a part of this project.

Photo 13.a

Site 13: View of Swamp Creek Bridge from upstream

Photo 13.b

View of stream channel just below Swamp Creek Bridge

Site 14

AFRP Grant Site List: 1700 Road (27N21) -Look at obliterating top end on USFS; redesign lower portion (narrowing road and improve drainage).

AFRP Grant Site List – Forest Service Notes: 1700 Road (27N21) -Look at obliterating top end on USFS; redesign lower portion (narrowing road and improve drainage).

Site Name: Collins 1700 Spur

General Description: Except for a short segment at its very beginning, the Collins 1700 spur (USFS 27N21) traverses rhyolite soils throughout its length in the Deer Creek watershed. This road is excessively wide along most of its length. The topography adjacent to this road is characterized as steep and finely divided by numerous unnamed tributaries. This road parallels and eventually crosses the upper reaches of what might be considered the east fork of Swamp Creek. In late spring and summer, this drainage remains dry. During heavy snow melt or high precipitation, runoff is high and bed load movement is significant.

Goals: Reduce erosion from the road by: (1.) Narrow the road width to 18 feet; (2.) Provide additional rolling dips; (3.) Establish an out slope road surface; (4.) Eliminate the inside ditch where beneficial; (5.) Abandon that portion of the 1700 through USFS ownership north of the east / west centerline of Section 13, T.28N., R.4E.; (6.) Apply a 4-inch crushed rock surface to the final road.

Priority (assessed in July 2001): High

Specifics: This road exceeds 30 feet in width in some areas and is generally 24 feet wide elsewhere. The grade is 8 to 10 percent and has no out slope and few rolling dips. The 1720 spur is washed out at the East Fork of Swamp Creek. Most drainages crossing the 1700 are dry by mid-May, lending themselves to low-water fords rather than culverts. Currently too much water becomes trapped within the road profile and is forced to run parallel to the road. Establishing an out slopped surface with adequate rolling dips would reduce surface water on the road. Rocking this road is more valuable than completing projects at Sites #1, #2, #3, #15, or #18.
Abandoning the upper end of the 1700, as it enters USFS ownership in the north half of Section 13 would eliminate the road from the active channel for just under one-half mile. Access to timberland north of this segment is possible using the Collins 1800.

Photo 14.a

Site 14: 1700 Road damage from plugged cross drain

Photo 14.b

Site 14: 1700 Road

Photo 14.c

Site 14: 1700 Road cross drain

Photo 14.d

Site 14: 1700 Road - Plugged cross drain

Site 15

AFRP Grant Site List: 1820 Road (28N89) -Look at redesigning drainage; remove inside ditch.

AFRP Grant Site List – Forest Service Notes: 1820 Road (28N97) Look at redesigning drainage at the beginning of this cost share road. Explore opportunities to remove inside ditch and eliminate diversion potential.

Site Name: Collins 1820 Spur

General Description: Asked to redesign drainage and remove inside ditch.

Goals: Reduce/stop ditch erosion

Priority (assessed in July 2001): Low

Specifics: This stretch of road was badly eroded after high winter flows in 1996. Repairs were made summer of 1997. Upon inspection, the ditch shows little soil movement and water flows in the ditch are very minor. This can be attributed partly to the cross drain culverts installed in 1997 and partly to the absence of heavy flows since then. Rocking the road surface, from the junction of the 1820 to the junction of the 1821, appears more beneficial in reducing sediment transport than working on the ditch or cross drain culverts.

Photo 15.a

Site 15: 1820 Road cross drain and inside ditch

Photo 15.b

Site 15: 1820 Road cross drain, inside ditch and road surface

Site 16

AFRP Grant Site List: 1821 Road system- Evaluate all spurs; 1821-2 through 1821-5. Minor spurs are not numbered on project map. They are those spurs to the south of the site number.

AFRP Grant Site List – Forest Service Notes: 1821 Road system. Evaluate all spurs; 1821-2 through 1821-5. Minor spurs are not numbered on project map. They are the spurs to the south of the site number. There are short spurs leading to two small FS pieces. Both have erosion problems on Collins. Look to truncate these spurs where erosion problems exist.

Site Name: Assorted spurs of the 1821 road.

General Description: These spurs are short in length and often cross no significant drainage. The cumulative erosion on all these spurs is again from surface erosion from water running down the road itself.

Goals: Reduce surface erosion from road.

Priority (assessed July 2001): Low, not because erosion is nonexistent, but due to lack of transport to Deer Creek or it's major tributaries.

Specifics: Out sloped and crushed rocked road surfaces would solve almost all of the surface erosion from these roads. Rolling dips would only occasionally be more helpful than out sloping.

Photo 16.a

Site 16: 1821 Road

Photo 16.b

Site 16: 1821 Road

Site 17

AFRP Grant Site List: Main Road I @ Swamp Creek -Log stringer bridge, water hole, and entire intersection need evaluation.

AFRP Grant Site List – Forest Service Notes: Main Road I at Swamp creek. Log-stringer bridge, water hole and entire intersection need evaluation.

Site Name: Lower Swamp Creek Bridge on Collins Main Road I

General Description: The current log bridge across Swamp Creek is twenty-plus years old and its log stringers are rotten.

Goals: Replace the decayed bridge with a more permanent structure that prevents bank erosion after collapse during high flow conditions. This work requires no equipment within the stream channel, beyond an excavator's bucket, and without dropping dirt or road fill into the channel.

Priority (assessed July 2001): Medium

Specifics: Construct the new bridge, before the current structure is removed. This allows general road traffic and construction equipment access to either side of Swamp Creek without crossing the channel. Remove the existing bridge after the new structure is in place. Remove road fill from the existing bridge prior to extraction of log stringers to avoid dropping this material into the channel.

Pre-poured concrete footings placed on existing stream banks; pre-stressed concrete slabs span creek channel; finished bridge is 30 feet long and 12 (or 16 feet) wide.

Photo 17.a—Main Road 1—Swamp Creek bridge– looking west over bridge
Photo 17.b—Main Road 1—Swamp Creek bridge– looking downstream at bridge
Photo 17.c—Main Road 1—Swamp Creek bridge– looking west at location
Photo 17.d—Main Road 1—Swamp Creek bridge– looking east at location
Photo 17.e—Main Road 1—Swamp Creek bridge– Broad view of proposed location

Photo 17.a

Main Road I—Swamp Creek bridge—road across bridge.

Photo 17.b

Main Road 1—Swamp Creek bridge– looking downstream at bridge

Photo 17.c | Main Road I—Swamp Creek bridge– looking west at proposed new location

Photo 17.d | Main Road I—Swamp Creek bridge– looking east at proposed new location

Photo 17.e	Main Road I— Swamp Creek bridge – Broad view of proposed new location

Site 18

AFRP Grant Site List: 1920 Road -look at stabilizing the road adjacent to Slate Creek. Look especially at wet areas; springs.

AFRP Grant Site List – Forest Service Notes: 1900 Road. Explore opportunities to stabilize portions of the road immediately adjacent to Slate Creek. Look especially at wet areas. All private

Site Name: 1920 Road

General Description: Road adjacent to Slate Creek

Goals: Stabilize Road

Priority (assessed July 2001): Low

Specifics:
Upon review, this road was found to be quite stable with little active erosion into Slate Creek. Few drainages cross this road and the soils developed from andesite parent material rather than rhyolite. A short segment of the 1920 parallels Slate Creek with the lower edge of the road prism right on the creek bank. The fill slope of this segment has been armored with large rip rap.

Photo 18.a

Site 18: 1900 Road Surface

Photo 18.b

Site 18: 1900 road riprap project

Site 19

AFRP Grant Site List: Round Valley to Onion summit – Road rocking. Can we narrow portions of this road to reduce rocking cost and future maintenance costs?

AFRP Grant Site List – Forest Service Notes: Round Valley to Onion summit Road Rocking. Explore opportunities to narrow and rock this road. Weigh benefits to watershed as well as long-term reduction of road maintenance costs.

Site Name: Main Road I Rocking; Round Valley to Onion Summit

General Description: Main Road I road base would benefit from application of 4 inches of crushed rock. Source of this rock is an existing pit near Onion Summit or from a proposed new pit (currently undeveloped) on the 2000 spur. These pits are on both ends of this road project. Collins needs to decide which location is desirable.

Goals: Using standard USFS rock specifications for forest roads, apply a crushed rock surface to Main Road I to reduce sedimentation of adjacent streams from road surface erosion.

Priority (assessed July 2001): High

Specifics: Rocking Main Road I would greatly decrease the quantity of sediments annually washed off this well traveled road.

Photo 19.a	Existing surface Main Road I at Round Valley.

Photo 19.b	Existing surface Main Road I west of Round Valley.

Site 20

AFRP Grant Site List: 2200 Road – Look at stabilizing and abandoning the upper end above class III crossing.

AFRP Grant Site List – Forest Service Notes: 2200 Road. Look at stabilizing and abandoning the upper end above Class III crossing.

Site Name: Collins 2200 Spur near Round Valley and tributary to Round Valley Creek.

General Description: The 2200 spur is a loop road that intersects Main Road I twice. The grade of the eastern half of the loop is less steep than the western half and soils there are more rocky. However, the eastern half crosses, by low-water ford, a Class III unnamed tributary to Round Valley Creek . Although rocky, this ford washes each winter and is not passable the following spring. Enough runoff, trapped in the road profile, runs down the road from the low-water ford to erode this road rendering it impassible every two or three years.

Goals: Abandon that part of the east loop of the 2200 Spur responsible for the majority of sediment transport to Round Valley Creek.

Priority (assessed July 2001): High, as Round Valley Creek is a direct sediment transport corridor into Deer Creek

Specifics: Recommend abandonment of the most troublesome segment of the eastern loop of the 2200 spur. This segment is described as: beginning at the east boundary of Section 34, T.28N., R.4E., hence follow the 2200 spur west-northwestward for 1,600 feet [short of the junction of the 2220 spur. Install tank traps at both ends to prevent traffic access. Rip the entire surface of abandoned road, slope profile to original contour, and remove berms.

Photo 20.a

2200 Spur—Low water ford on east loop.

Photo 20.b

2200 Spur—End of 12% grade below low water ford.

Photo 20.c	2200 Spur—10 year old rip rap between channel and road.

Photo 20.d	2230 Spur—Crossing Round Valley Creek; 2200 Spur in background.

Site 21

AFRP Grant Site List: Main Road l @ Forked Creek – Look at rocking approaches; assess smokestack culvert for structural weakness.

AFRP Grant Site List – Forest Service Notes: Main Road I at Forked Creek. Look at rocking approaches and assess need to replace smoke stack culvert.

During ongoing road repair in 2001, this site was improved or corrected to the satisfaction of the landowner. Therefore, this site was deleted from this grant project at the request of the Collins Pine Company.

Site 22

AFRP Grant Site List: 1112-1 spur – Look at stabilizing the channel adjacent to this road.

AFRP Grant Site List – Forest Service Notes: 1112-1 spur. Look at stabilizing the channel adjacent to this road. All private.

Site Name: Deer Creek adjacent to the Collins 1112-1 spur road.

General Description: Deer Creek starts high up the north face of Carter Mountain. The stream drops off the steep slopes of Carter Mountain and quickly transitions through a broad alluvial fan before peacefully entering upper Deer Creek Meadows. The dense understory of the present forest supplies an over abundance of large woody material in and around the active channel. Ample watershed exists above this alluvial plane to provide significant runoff during high flow events. High channel gradients above the alluvial plane equate to high stream velocity and this produces surprisingly high bed loads for a stream its size. When these high flows and their associated bed loads slow through the alluvial plane, deposition against meanders and woody material within the channel will occur. The channel easily plugs and overflows, especially onto its flat eastern banks. These new channels under high flows erode, adding to an already high bed load condition. Such events, however, are not new to this reach of Deer Creek. Evidence of older depositions are easily found east of its active channel. The same dynamics can be seen on other unnamed tributaries that drain the north slope of Carter Mountain.

Morphologically, this is the typical formation of juvenile alluvial planes. Land management practices, as an additional dimension, can either exasperate or moderate these natural events. Activities to acquire domestic water from this creek have been active since early 1940's. One such diversion remains today, requiring channel work to keep water entering the pipe and elsewhere 'a cleared route' down the buried pipe line that flood waters have followed. Logging roads and skid trails are adjacent to and occasionally cross the active stream channel. Recent crossings are stabilized after use, but older ones still provide 'a cleared route' for flood water passage. Silvicultural treatments which reduce the presence of woody material, especially within the flood channel, would be beneficial.

Goals: Reduce excessive sediment transported by upper Deer Creek into its upper meadow system.

Priority (assessed July 2001): Compared to other road related sediment sources, medium to low.

Specifics: Solutions to flood water damage at this site involve both road repair and timber stand improvement, part of which exceeds the management of this grant project. Little can be done within the channel itself, short of placing rip rap along the eroded banks, as demonstrated in Photo 22.d. Reducing, though not excluding, the volume of large woody material in the stream and along its banks might reduce erosion caused by creation of new channels. Flood waters must be excluded from using existing roads or skid trails as secondary channels.

The above suggestions involve broad land management decisions that go beyond the site specific solutions intended by this grant project. No specific site solutions were determined to be applicable to this project.

Photo 22.a	Domestic water supply diversion; note artificial dam in foreground.

Photo 22.b	Alluvial bed load outside of stream channel and dense understory.

Photo 22.c

Channel erosion and undercut bank trees.

Photo 22.d

Stabilization efforts at a temporary road crossing.

PERMITTING STRATEGY

This strategy is provided to assist with implementation of the recommended engineered projects designed to reduce erosion and sediment load in the Deer Creek Watershed.

There are significant complex issues related to this project due to the land ownership (private vs. public) as well as recognizing that a portion of the project is on cost-shared roads (between Collins Pine and the USFS.) In many respects, the easiest portion of permitting will be for the projects performed on Forest Service lands simply due to existing agreements between the Forest Service and various agencies which are discussed on the following page.

There is also another significant issue related to how the project is funded. It is anticipated that this project will be funded by CALFED. When awarded a project by CALFED, administration of the grant can be turned over to either a State or Federal agency. Each individual agency has it's own set of requirements (State of California or Federal Government.) The following table explains the NEPA and CEQA requirements:

STATE OF CALIFORNIA AGENCY AS GRANT ADMINSISTRATOR

PROPERTY OWNER	NEPA OR CEQA?	COMMENTS
Collins Pine	CEQA Only	Lead Agency—TBD
Cost Share on Collins Property	CEQA Only	Lead Agency—TBD
Cost Share on USFS Property	NEPA with CEQA follow up	USFS Lead Agency
USFS	NEPA with CEQA follow up	USFS Lead Agency

FEDERAL AGENCY AS GRANT ADMINISTRATOR

PROPERTY OWNER	NEPA OR CEQA?	COMMENTS
Collins Pine	NEPA with CEQA follow up	USFS Lead Agency
Cost Share on Collins Property	NEPA with CEQA follow up	USFS Lead Agency
Cost Share on USFS Property	NEPA with CEQA follow up	USFS Lead Agency
USFS	NEPA with CEQA follow up	USFS Lead Agency

ADDITIONAL PERMITS

The complexity of the permitting does not stop at the NEPA/CEQA level. As previously mentioned, it is significantly easier to permit projects on USFS land than on privately owned land. This is due to some existing agreements between the agencies and the USFS. The following is intended as an overview of the additional permits required

1600 STREAM ALTERATION AGREEMENT

Currently, the USFS has a programmatic agreement with the California Department of Fish and Game (DFG) thus no Stream Alteration Agreement is required on USFS property. In the event that the project falls on Collins Pine property, a stream alteration agreement will be required for any project which may alter or change the stream channel. This is generally an issue when there is construction equipment moving within the stream channel such as on the bridge demolition or replacement projects. It is recommended that when these projects are funded, to request one regional streambed alteration agreement for all of the projects.

UNITED STATE ARMY CORPS OF ENGINEERS (USACOE) 404 PERMIT

According to federal law, the United States Army Corps of Engineers can take up to 135 days to issue this permit although there are provisions to grant themselves an extension of time. Currently, these permits are taking approximately one year from the time of application (due primarily to the energy shortage and the staffing shortages of the agencies). The significant portion of this permit is that it triggers a Section 7 Consultation with the United States Fish and Wildlife Service which subsequently issues a biological opinion related to the Endangered Species Act. Again, the USFS has a significant advantage in this area since a Nationwide 27 permit has been issued to the Forest Service for restoration projects thus no 404 permit is required. It is suggested that the Forest Service act as the lead agency for all permitting issues and request using the Nationwide 27 permit for projects on Collins Pine or Cost Share roads as well as those on Forest Service property. This will require approval from the USACOE.

CERTIFICATION BY REGIONAL WATER QUALITY CONTROL BOARD

The Nationwide 27 permit issued to the Forest Service requires certification from the Regional Water Quality Control Board (RWQCB). The Forest Service has an existing certification agreement with the RWQCB. This agreement states that projects developed by the Forest Service, meeting the conditions of the Best Management Practices (BMP) developed by the State and Forest Service, do not require additional certifications from the RWQCB. It is suggested that with the Forest Service as Lead Agency, that a request for the same waiver on the basis that the work will be supervised by the Forest Service.

In summary, it would be highly beneficial if this project is administered by a Federal Agency because NEPA would be required for all portions of the project. The existing agreements mentioned above would make the permitting effort much easier than if NEPA is required on USFS property and CEQA is required on Collins property. There is also a significant time savings because CEQA Section 15221—NEPA Document Ready Before CEQA document. This section allows for the NEPA document to be utilized in lieu of preparing a separate CEQA document.

In any event, it is highly recommended to convene all relevant agencies including DFG, USACOE, USFWS, RWQCB to discuss the applicability of the USFS existing agreements to the entire project.

In a similar restoration project being constructed on Gurnsey Creek (North Fork of Deer Creek), the CSU, Chico Research Foundation, Meadowbrook Conservation Associates, and the USFS have prepared NEPA documentation.

The NEPA documents included Biological Evaluation and Environmental Assessments. The result of these documents was a "Finding of No Significant Impact" (FONSI). The evaluation also considered threatened and/or endangered species in the vicinity as listed on the Natural Diversity Database.

The species of concern were:

1. Northern Goshawk
2. Willow Flycatcher
3. American Martin
4. Anadromous Fish
5. Cascade or Yellow-legged frog
6. Red Legged Frog (project area not within their habitat)

The Decision Notice for this project is included to assist the follow up implementation grant.

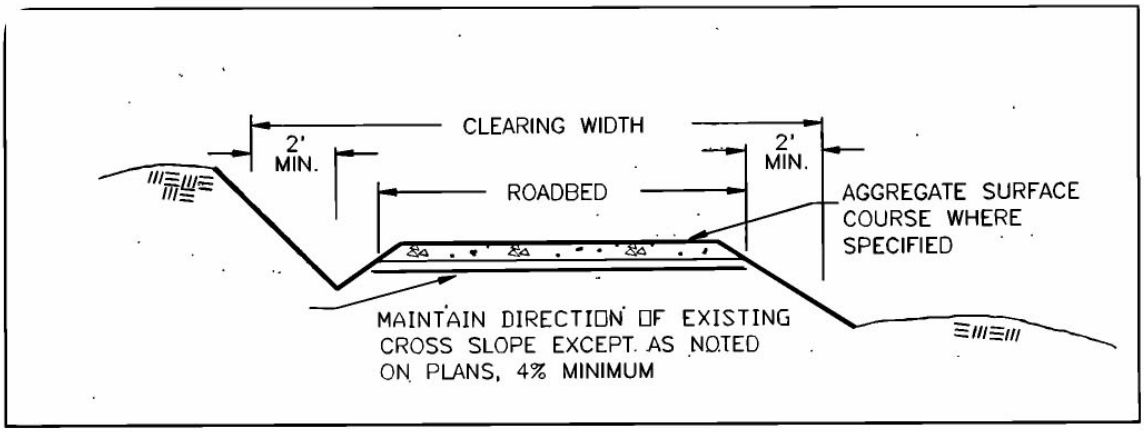
Appendix 1
Engineered Drawings

By Meadowbrook Conservation Associates and USFS

Figure 1—Aggregate Base

Special Project specification 200.1

Typical Aggregate Rocking

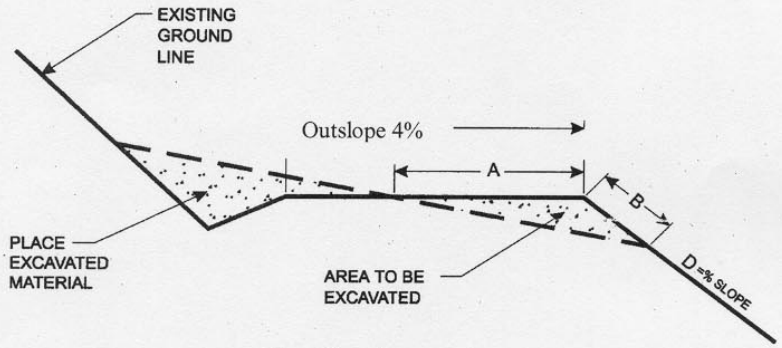


General Notes:
1) Rocking width is to existing road bed or 14ft. whichever is lesser.
2) Aggregate depth is typically 4" compacted. Additional depth or width if any, will be specified in writing.

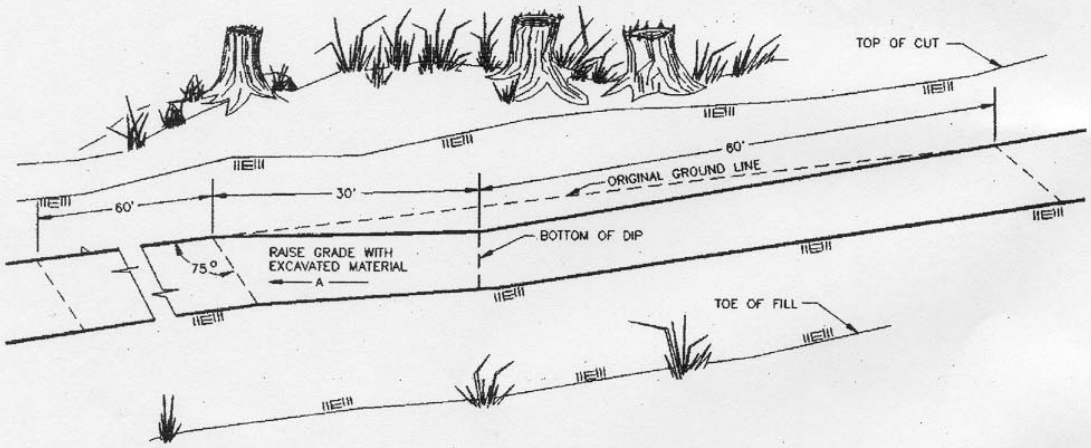
Lassen Watershed Restoration			
Project	**Sheet Name**	**Sheet No.**	**Total Sheet**
Almanor Area 1	Aggregate Base	3	18

Figure 2—Outslope Road Prism

Special Project Specification 200.3



Outsloping



ROLLING DIP

General Notes

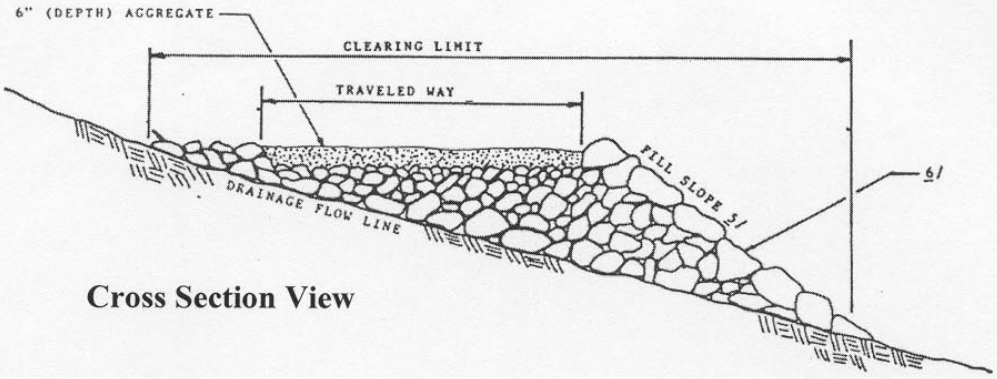
1) Raise grade portion of rolling dip can be accomplished with excavated material or with suitable imported material from commercial source
2) Outsloping shall be to 4%
3) Dimensions A and B for outsloping will vary. Excavation is only what is required to achieve 4% outslope

Lassen Watershed Restoration			
Project	**Sheet Name**	**Sheet No.**	**Total Sheet**
Almanor Area 1	Outslope & Rolling Dip	5	18

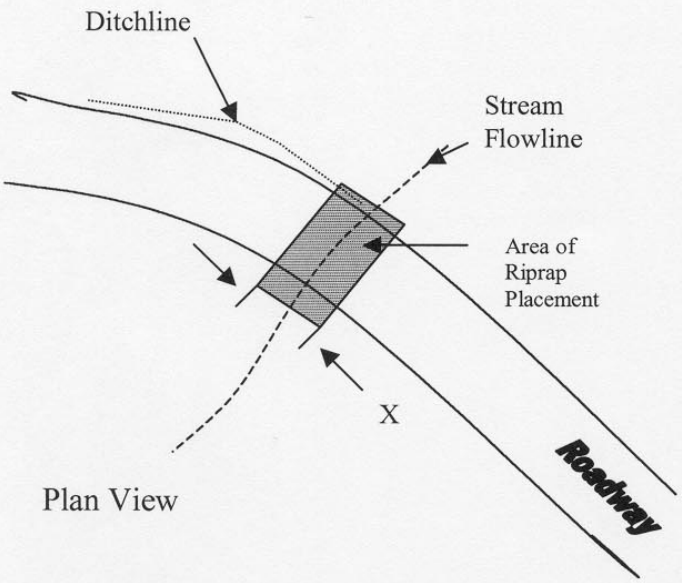
Figure 3—Boulder Ford Crossing

Special Project Specification 200.6

Boulder Ford Crossing



Cross Section View



Plan View

Notes:
5/ Fill slope shall be constructed to 1:1 slope or as staked.
6/ Larger rocks shall be placed on face of fill slope and keyed into channel bottom to provide support for riprap above

General Notes:
1) Remove loose unconsolidated material up to 1 foot below stream grade unless bedrock is encountered
2) 2" drain rock material shall be used for the running surface
3) Bankfull dimension "X" will be staked on the ground and designated in writing
4)Traveled way shall be outsloped 2-4%
5)Riprap placement may occur at the bottom of a dip vertical curve to drain water from ditchline

Lassen Watershed Restoration

Project	Sheet Name	Sheet No.	Total Sheet
Typical	Boulder Ford Xing	10	18

Figure 4—Temporary Culvert Crossing

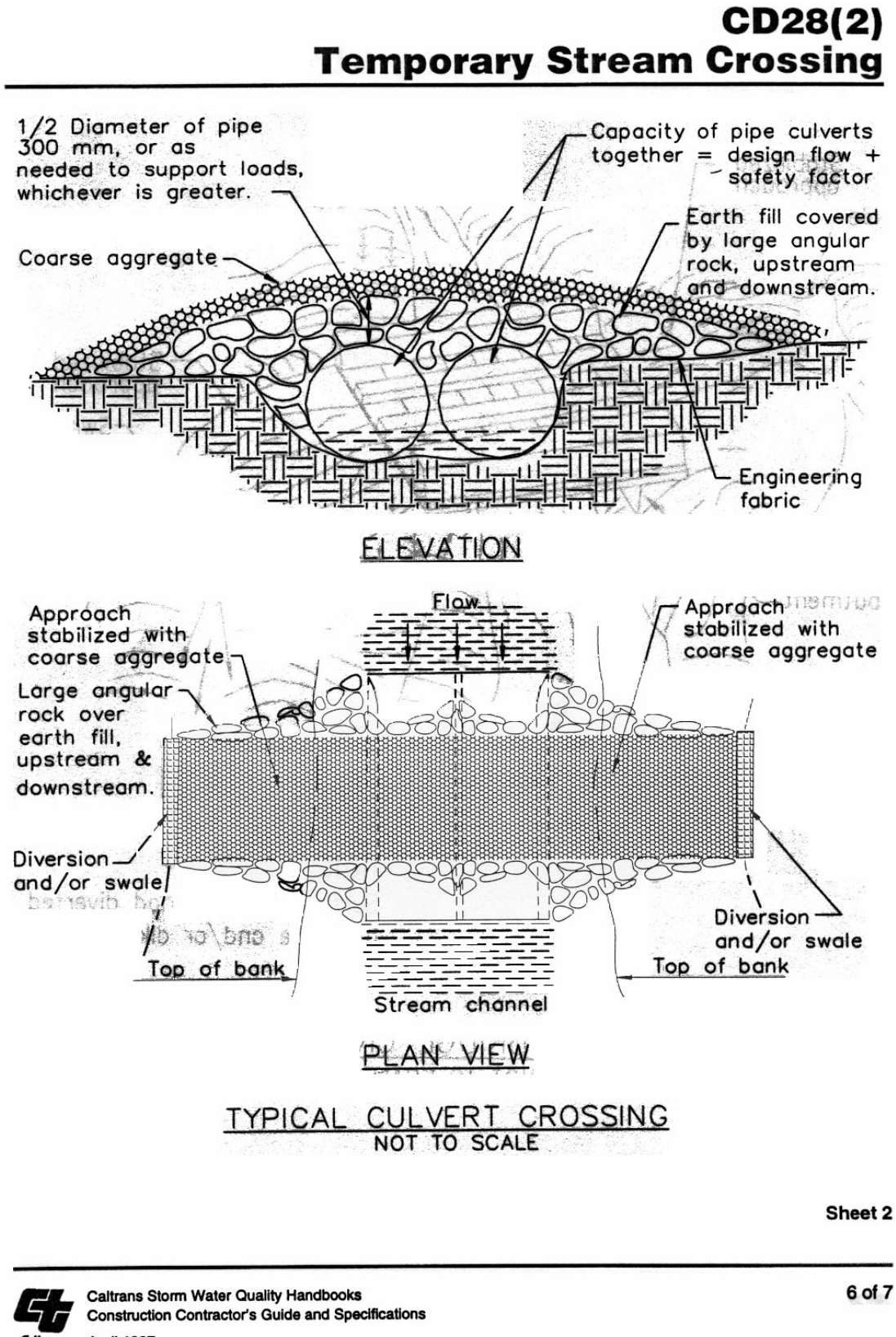
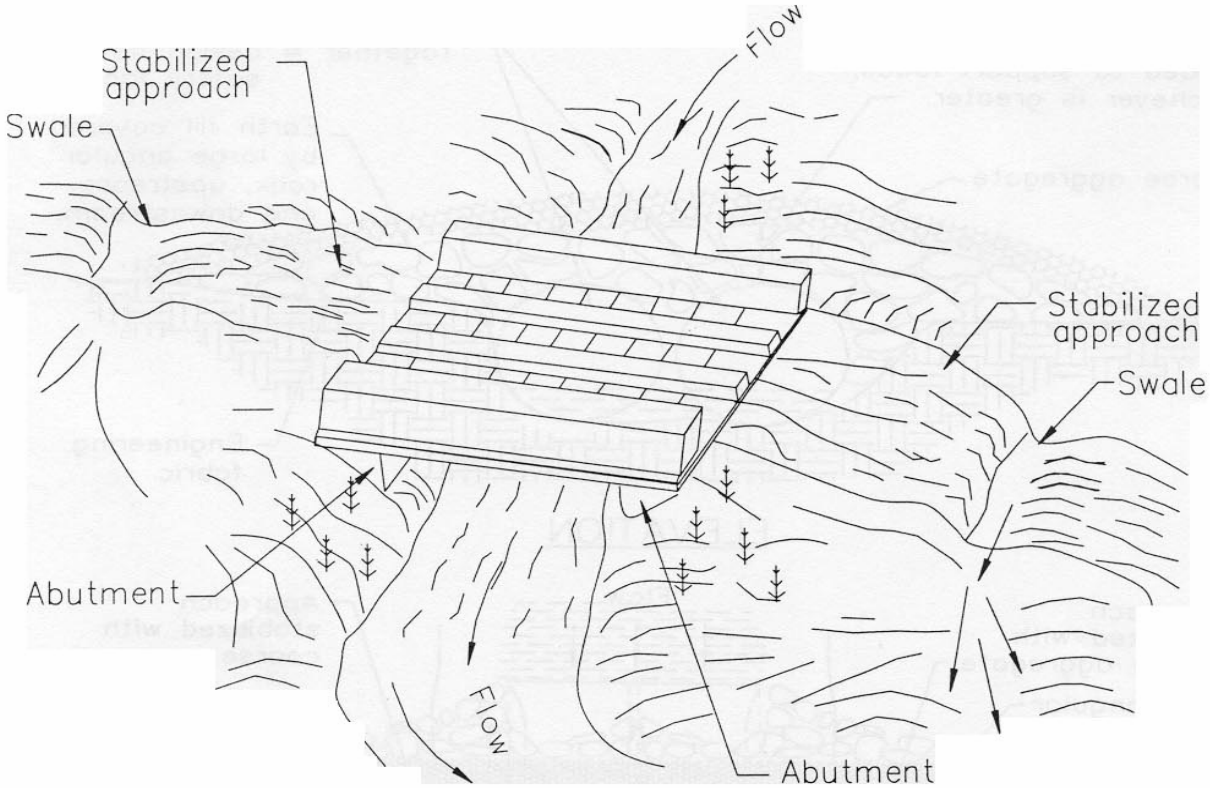


Figure 5—Temporary Bridge

CD28(2)
Temporary Stream Crossing



NOTE:
Surface flow of road diverted by swale and/or dike.

TYPICAL BRIDGE CROSSING
NOT TO SCALE

Sheet 1

Figure 6—Road Barriers

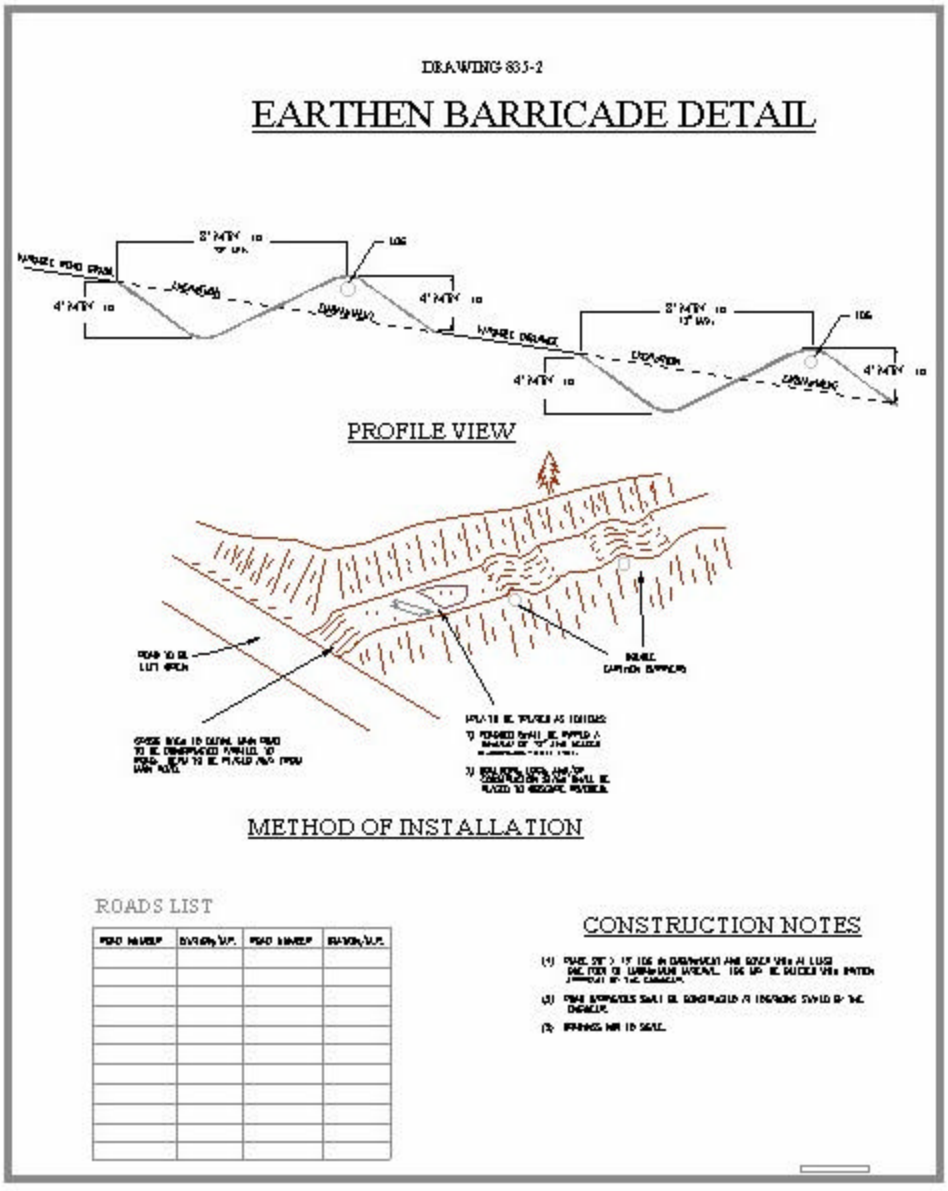
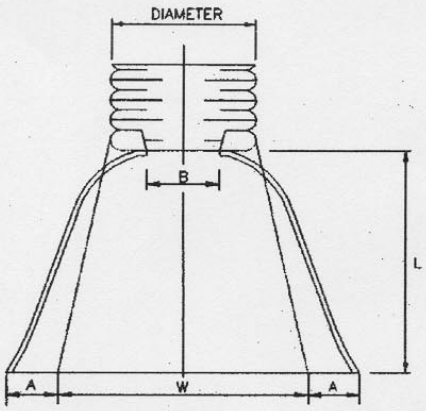
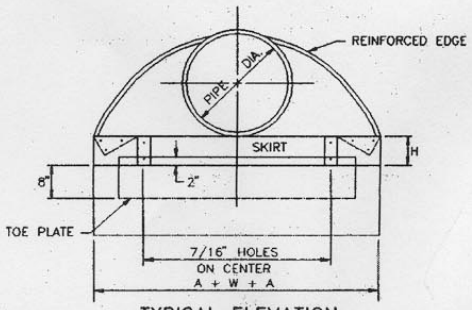


Figure 7—Metal End Section

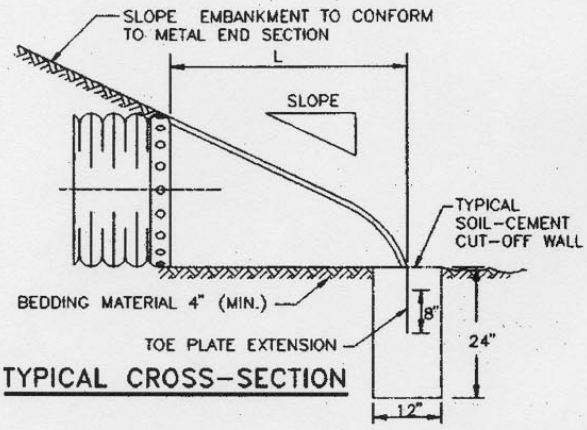
Special Project Specification 200.4



TYPICAL PLAN



TYPICAL ELEVATION



TYPICAL CROSS-SECTION

General Notes:
1) Make connection with existing pipe such that no leakage results from the connection
2) All meal end sections are shall conform to industrial standards for thickness and dimensions normally specified for the indicated pipe diameter

Lassen Watershed Restoration			
Project	**Sheet Name**	**Sheet No.**	**Total Sheet**
Almanor Area 1	Metal End Section	6	18

Appendix 2
Feasibility Cost Estimates

By CSU, CHICO RESEARCH FOUNDATION

FEASIBILITY COST ESTIMATE

The feasibility estimate costs in this report are based on preliminary engineering details provided by Meadowbrook Conservation Associates. It is recognized that in many cases, the USFS can provide resources such as rock, trees, and equipment however this estimate was prepared with the following assumptions:

1. All materials will need to be purchased on the open market.
2. Aggregate Base is available for $12 per ton FOB jobsite.
3. Culvert Pricing was obtained from Camellia Pipe Supply in Chico, CA
4. Culverts are available in 20 foot lengths. Any recommendation from Meadowbrook for a 36 foot culvert was priced at 40 feet to avoid labor costs associated with cutting pipe.
5. Meadowbrook recommended 40" diameter culverts which are not readily available. These culverts were priced as 42" diameter.
6. Equipment rates were obtained from the CalTrans acceptable hourly rates for force account work. This list for Caterpillar Equipment is included.
7. Labor rates were obtained from the current prevailing wage rates determination made by the Director of Industrial Relations pursuant to California Labor Code Part 7, Chapter 1, Article 2, Sections 1770, 1773, and 1773.1
8. In some cases, a 10 wheel truck was budgeted to dispose of culverts which will be replaced however no allowance was made for disposal fees due to the unknown location of disposal.
9. Trucking costs for both water trucks and the 10 wheeler trucks were budgeted as $100 dollars per hour and include both Operation and Maintenance (O&M).
10. Estimates for Aggregate base were made on the assumption that there are 1.5 tons per cubic yard after compaction and that the material will shrink approximately 12-15%.
11. No overtime was budgeted for in the project.
12. As in most feasibility estimates, there is an allowance for indirects and overhead as follows:
    a. Indirect Costs at 5%
    b. Overhead Allocation at 3%
    c. Profit at 5%
    d.. Contingency at 15%
13. The attached estimate is only for direct costs. The following spreadsheet indicates the directs costs as well as the markups.
14. The total feasibility cost of construction for the entire project is: $3,139,403
15. The total feasibility costs of the "high priority" projects is: $1,620,203